IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of: Kenneth E. Welker *et al.*
Serial No.: 10/597,227
Filed: July 17, 2006
For: Seismic Cable Positioning Using Coupled Inertial System Units

Group Art Unit: 3663
Confirmation No.: 7982
Examiner: Krystine E. Breier
Atty. Dkt. No.: 2088.003300
Client Docket: 14.0250-PCT-US

APPEAL BRIEF

Mail Stop Appeal Brief - Patents
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

Applicants hereby submit this Appeal Brief to the Board of Patent Appeals and Interferences in response to the "Notice of Panel Decision from Pre-Appeal Brief Review" dated September 22, 2010. By rule, Applicants have until at least October 22, 2010, to file their "Appeal Brief". This "Appeal Brief" is therefore timely filed.

The fee for filing this Appeal Brief is $540 and the Commissioner is authorized to deduct said fee from Williams, Morgan & Amerson's Deposit Account No. 50-0786/2088.003300/JAP.

It is believed that no additional fee is due, however, should any fees under 37 C.F.R. §§ 1.16 to 1.21 be required for any reason, consider this paragraph as authorization to withdraw the said fees from Williams, Morgan & Amerson, P.C. Deposit Account No. 50-0786/2088.003300/JAP.

I. REAL PARTY IN INTEREST

WesternGeco LLC, the assignee hereof, is the real party in interest. WesternGeco LLC is a wholly owned subsidiary of Schlumberger Technology Corporation.

II. RELATED APPEALS AND INTERFERENCES

There are no related appeals or interferences of which Applicants, Applicants' legal representative, or the Assignee are aware that will directly affect or be directly affected by or have a bearing on the decision in this appeal.

III. STATUS OF THE CLAIMS

Claims 1-69 are pending in the case. Each of claims 1-69 was rejected as follows:

- claims 1-5, 7-8,10-19, 21-30, and 32-69 as obvious under 35 U.S.C. 103(a) over U.S. Letters Patent 5,640,325 ("Banbrook *et al.*") in view of U.S. Letters Patent 6,625,083 ("Vandenbroucke");
- claim 6 as obvious under 35 U.S.C. 103(a) over Banbrook *et al.* and Vandenbroucke in combination with U.S. Letters Patent 6,011,752 ("Ambs"); and
- claims 9, 20, and 31 as obvious under 35 U.S.C. 103(a) over Banbrook *et al.* and Vandenbroucke in view of U.S. Letters Patent 5,739,787 ("Burke *et al.*").

Applicants appeal from each of these rejections. For the convenience of the Office, Applicants expressly identify the claims in this appeal as claims 1-69.

IV. STATUS OF AMENDMENTS

There were no amendments submitted after the "final" Office Action. A response was filed to the "final" Office Action on June 22, 2010, but no amendments were presented.

V. SUMMARY OF CLAIMED SUBJECT MATTER

The invention pertains to seismic surveying and, more particularly, to a method and apparatus for more accurately determining the position of seismic survey objects in a marine seismic survey. (p. 1, lines 5-6) The context of the invention is first set forth. A brief summary of selected aspects of the invention itself as claimed is then presented in accordance with the Rules of Practice. This is followed by an indexing of the claims back into the specification and drawings as required by the Office in its current implementation of the Rules of Practice.

A. CONTEXT OF THE INVENTION

Seismic exploration is conducted on both land and in water. (p. 1, lines 8-13) A survey typically involves deploying acoustic source(s) and acoustic sensors at predetermined locations. *Id.* The source(s) imparts acoustic waves into the geological formations. *Id.* Features of the geological formation reflect the acoustic waves to the sensors. *Id.* The sensors receive the reflected waves, which are the processed to generate seismic data. *Id.* Analysis of the seismic data may then indicate probable locations of the hydrocarbon deposits. *Id.*

Accurate knowledge of the positions of the seismic survey objects, *e.g.*, acoustic sources and acoustic receivers, is important to the accuracy of the analysis. (p. 1, lines 14-19) Marine surveys are more dynamic than land surveys, and sources, sensors and other objects move at a much higher frequency due to environmental conditions more difficult to control. *Id.* Many factors complicate determining the position of the sensors, including wind, currents, water depth, and inaccessibility. (p. 1, lines 20-24) Some approaches model the shape and/or position of the seismic cable during deployment. (p. 1, lines 32-36) Other approaches use various methods of coordinate estimation, either by direct measurement or by a force-resultant model computation based on force measurements. (p. 1, line 37 to p. 2, line 2) Methods using direct measurements include GPS, acoustics distances, compass directions and others are also sometimes used. *Id.*

B. BRIEF SUMMARY OF SELECTED ASPECTS OF THE INVENTION

The present invention may be used in either a seabed, or "ocean bottom" survey, such as that shown in FIG. 1, or in a towed array survey such as that shown in FIG. 2. (p. 3, lines 3-4, 28-29) For the sake of convenience, however, the invention will be described herein primarily as related to the seabed embodiment of FIG. 1.

Sensors such as acoustic receivers are deployed on the seismic cables 106 in sensor modules 127 along with inertial positioning devices ("IPDs") 130. (p. 3, lines 11-19) The deployment of the seismic cable 106 is shown in FIG. 4, reproduced below. (p. 4, line 39 to p. 5, line 2) The IPDs 130 include at least one inertial measurement unit ("IMU"), such as the IMU 300, shown in FIG. 3. (p. 3, lines 11-19; p. 4, lines 14-16) The IPDs 130 may be positioned with the sensor modules 127 or separately therefrom. (p. 4, lines 3-13, 33-38) In the embodiment illustrated in FIG. 3, the IMU 300 is deployed as part of a streamer steering device known as a "bird". (p. 4, line 14-32)

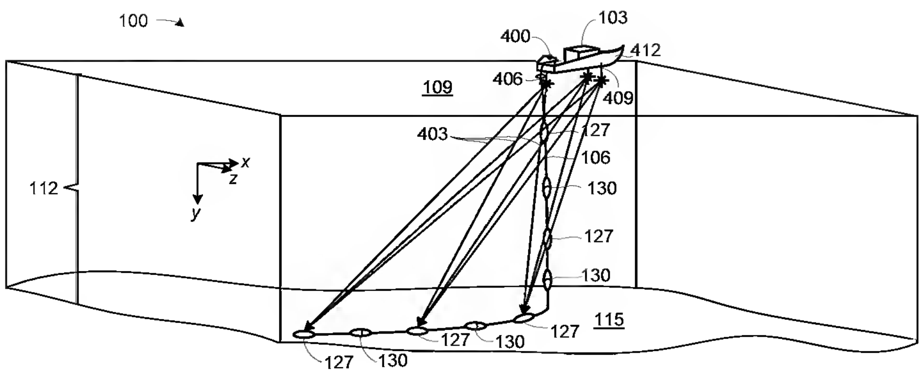


FIG. 4

The seismic cable 106 is deployed from a known point 400. (p. 5, lines 3-4) As it descends to the seabed 115, environmental forces such as current and wind distort the shape of the seismic cable 106. (p. 4, line 39 to p. 5, line 2) The IMUs 300 of the IPDs 130 measure the deviations produced by the distortions and transmit the measurements to the data collection system 500 shown in FIG. 5. (p. 5, lines 3-13) The data collection system 500 then applies the measured deviations and the measured descent to the known deployment point 400 to determine the position of the seismic cable 106 on the bottom 115. (p. 4, line 39 to p. 6, line 8) More precisely, the positions of the IPDs 130 can be determined in this manner, and the positions of the sensor modules 127 can be inferred or calculated based on the positions of the IPDs 130 and other information. *Id.*

For instance, the IPDs 130 and the sensor modules 127 may be located at known points (*e.g.*, 400, FIG. 4; p. 5, lines 3-13; p. 6, lines 9-14) on the seismic cable 106. (*e.g.*, p. 6, lines 9-14) The positions of the IPDs 130 on the bottom 115 can then be determined as described above. *Id.* The shape and position of the seismic cable 106 can then be derived from the positions of the IPDs 130. *Id.* Finally, the positions of the sensor modules 127 can then be determined from the shape of the seismic cable 106 and the known points along the seismic cable 106 at which the sensor modules 127 are located. *Id.*

Note also that the invention is not limited to the positioning of seismic cables. (p. 8, lines 13-18) The present invention may be applied to determine the position of any seismic survey object. *Id.* A seismic survey object can be any object that may be employed in the conduct of a seismic survey, excluding vehicles. *Id.* Thus, survey vessels, autonomous unmanned vehicles, ("UAVs"), remotely operated vehicles ("ROVs"), and the like are excluded while other pieces

such as seismic cables, and acoustic sources (*e.g.*, the acoustic sources 124 in FIG. 1, FIG. 2) are included. *Id.*

C. INDEXING OF THE CLAIMS

Turning now to the language of the rejected claims, **claims 1, 14, 25, 36, 48, 59 are independent**. With respect to **claim 1**, an apparatus for use in a marine seismic survey (*e.g.*, 100, FIG. 1; p. 3, lines 3-27; 200, FIG. 2; p. 3, line 28 to p. 4, line 2; 800, FIG. 8; p. 8, lines 19-27), the invention comprises:

a short baseline acoustic system or an ultra short baseline acoustic system (*e.g.*, p. 7, lines 10-33), including:

a seismic survey (*e.g.*, 100, FIG. 1; p. 3, lines 3-27; 200, FIG. 2; p. 3, line 28 to p. 4, line 2; 800, FIG. 8; p. 8, lines 19-27) object (*e.g.*, 127, FIG. 1; 227, FIG. 2; p. 8, lines 13-18, 28-36); and

an inertial measurement unit (*e.g.*, 300, FIG. 3; p. 4, lines 14-32) coupled to the seismic survey object at a known point (*e.g.*, 400, FIG. 4; p. 5, lines 3-13; p. 6, lines 9-14) and from which the movement of the seismic survey object can measured during a seismic survey (*e.g.*, 100, FIG. 1; p. 3, lines 3-27; 200, FIG. 2; p. 3, line 28 to p. 4, line 2; 800, FIG. 8; p. 8, lines 19-27) such that the position of the known point during the marine seismic survey can be determined.

With respect to **claim 14**, a marine seismic spread (*e.g.*, 100, FIG. 1; p. 3, lines 3-27; 200, FIG. 2; p. 3, line 28 to p. 4, line 2; 800, FIG. 8; p. 8, lines 19-27), the invention comprises:

a short baseline acoustic system or an ultra short baseline acoustic system (*e.g.*, p. 7, lines 10-33), including:

a plurality of seismic survey objects (*e.g.*, 127, FIG. 1; 227, FIG. 2; p. 8, lines 13-18, 28-36), including a plurality of acoustic receivers and at least one acoustic source (p. 3, lines 11-19), distributed over a survey area from at least one known point (*e.g.*, 400, FIG. 4; p. 5, lines 3-13; p. 6, lines 9-14); and

a plurality of inertial positioning devices (*e.g.*, 300, FIG. 3; p. 4, lines 14-32) coupled to the seismic survey objects at known points (*e.g.*, 400, FIG. 4; p. 5, lines 3-13; p. 6, lines 9-14) and capable of taking inertial measurements

of the movement of the seismic survey objects relative to the known point such that the position of the known points during the marine seismic survey can be determined.

With respect to **claim 25**, an apparatus for use in a marine seismic survey (*e.g.*, 100, FIG. 1; p. 3, lines 3-27; 200, FIG. 2; p. 3, line 28 to p. 4, line 2; 800, FIG. 8; p. 8, lines 19-27), the invention comprises:

a short baseline acoustic system or an ultra short baseline acoustic system (*e.g.*, p. 7, lines 10-33), including:

a seismic cable (*e.g.*, 106, FIG. 1; 206, FIG. 2); and

an inertial measurement unit (*e.g.*, 300, FIG. 3; p. 4, lines 14-32) coupled to the seismic cable at a known point (*e.g.*, 400, FIG. 4; p. 5, lines 3-13; p. 6, lines 9-14) and from which the movement of the seismic cable can measured during a seismic survey (*e.g.*, 100, FIG. 1; p. 3, lines 3-27; 200, FIG. 2; p. 3, line 28 to p. 4, line 2; 800, FIG. 8; p. 8, lines 19-27) such that the position of the known point during the marine seismic survey can be determined.

With respect to **claim 36**, a method (p. 8, line 37 to p. 9, line 3) for use in a marine seismic survey (*e.g.*, 100, FIG. 1; p. 3, lines 3-27; 200, FIG. 2; p. 3, line 28 to p. 4, line 2; 800, FIG. 8; p. 8, lines 19-27), the invention comprises:

taking inertial measurements of movement of selected points on a seismic spread (*e.g.*, 100, FIG. 1; p. 3, lines 3-27; 200, FIG. 2; p. 3, line 28 to p. 4, line 2; 800, FIG. 8; p. 8, lines 19-27) in a short baseline acoustic system or an ultra short baseline acoustic system (*e.g.*, p. 7, lines 10-33) relative to at least one known point (*e.g.*, 400, FIG. 4; p. 5, lines 3-13; p. 6, lines 9-14); and

applying the inertial measurements to the known point to determine the positions of the selected points.

With respect to **claim 48**, a method (p. 8, line 37 to p. 9, line 3) for use in a marine seismic survey (*e.g.*, 100, FIG. 1; p. 3, lines 3-27; 200, FIG. 2; p. 3, line 28 to p. 4, line 2; 800, FIG. 8; p. 8, lines 19-27), the invention comprises:

deploying a short baseline acoustic system or an ultra short baseline acoustic system (*e.g.*, p. 7, lines 10-33), including a seismic cable (*e.g.*, 106, FIG. 1; 206, FIG. 2) at a known point (*e.g.*, 400, FIG. 4; p. 5, lines 3-13; p. 6, lines 9-14);

taking inertial measurements of movement (p. 5, lines 3-13) of selected points on the seismic cable relative to the known point during the deployment; and

applying the inertial measurements (p. 5, lines 3-13) to the known point to determine the positions of the selected points.

With respect to **claim 59**, a method (p. 8, line 37 to p. 9, line 3) for use in a marine seismic survey (*e.g.*, 100, FIG. 1; p. 3, lines 3-27; 200, FIG. 2; p. 3, line 28 to p. 4, line 2; 800, FIG. 8; p. 8, lines 19-27), the invention comprises:

conducting a survey (*e.g.*, 100, FIG. 1; p. 3, lines 3-27; 200, FIG. 2; p. 3, line 28 to p. 4, line 2; 800, FIG. 8; p. 8, lines 19-27) with a seismic spread (*e.g.*, 100, FIG. 1; p. 3, lines 3-27; 200, FIG. 2; p. 3, line 28 to p. 4, line 2; 800, FIG. 8; p. 8, lines 19-27) including a short baseline acoustic system or an ultra short baseline acoustic system (*e.g.*, p. 7, lines 10-33) deployed from at least one known point(*e.g.*, 400, FIG. 4; p. 5, lines 3-13; p. 6, lines 9-14);

taking inertial measurements (p. 5, lines 3-13) of movement of selected points on the seismic spread relative to the known point during the conduct of the seismic survey; and

applying the inertial measurements (p. 5, lines 3-13) to the known point to determine the positions of the selected points.

There are no "means-plus-function" limitations in the claims. Note that the references in parentheses are not limitations in the claims but relate the claim language to Applicants' disclosure in compliance with the Rules of Practice.

VI. GROUNDS OF REJECTION TO BE REVIEWED ON APPEAL

A. Whether claims 1-5, 7-8,10-19, 21-30, and 32-69 are obvious under 35 U.S.C. §103(a) over U.S. Letters Patent 5,640,325 ("Banbrook *et al.*") in view of U.S. Letters Patent 6,625,083 ("Vandenbroucke").

B. Whether claim 6 is obvious under 35 U.S.C. §103(a) over Banbrook *et al.* and Vandenbroucke in combination with U.S. Letters Patent 6,011,752 ("Ambs").

C. Whether claims 9, 20, and 31 are obvious under 35 U.S.C. §103(a) over Banbrook *et al.* and Vandenbroucke in view of U.S. Letters Patent 5,739,787 ("Burke *et al.*").

VII. ARGUMENT

The Board reviews the grounds of rejection *de novo* as to issues raised during prosecution on the merits. *In re Oetiker*, 24 U.S.P.Q.2d (BNA) 1443, 1444 (Fed. Cir. 1992) ("In reviewing the examiner's decision on appeal, the Board must necessarily weigh all of the evidence and argument."); *Ex parte Frye*, 94 U.S.P.Q.2d (BNA) 1072, 1075 (Bd. Pat. App. & Int. 2010). Accordingly, the Board owes no deference to the Examiner's position during prosecution in this proceeding.

Each of the rejections is for obviousness. Each includes the combination of U.S. Letters Patent 5,640,325 ("Banbrook *et al.*") in view of U.S. Letters Patent 6,625,083 ("Vandenbroucke"). All of the rejections are therefore subject to the same legal standards and any defect in the combination of Banbrook *et al.* and Vandenbroucke will afflict all the rejections. The rejections of claims 6, 9, 20, and 31[1] all rely on the combination of Banbrook *et al.* and Vandenbroucke to render obvious the claims from which they depend. Accordingly, if those claims are not obvious over Banbrook *et al.* and Vandenbroucke, then these claims are not obvious over the art as a whole, either. Applicants nevertheless argue each ground of rejection separately as required by the rules of practice.

A. CLAIMS 1-5, 7-8,10-19, 21-30, & 32-69 ARE UNOBVIOUS OVER BANBROOK *ET AL.* & VANDENBROUCKE

The Office erred in rejecting claims 1-5, 7-8,10-19, 21-30, and 32-69 as obvious under 35 U.S.C. §103(a) over Banbrook *et al.* in view of Vandenbroucke. There are a number of errors of both law and fact, chief among these being:

- the Office misconstrues Banbrook *et al.*;
- the art of record fails to teach or suggest all the limitations of the claims;
- Banbrook *et al.* is outside the scope and content of the prior art;
- Banbrook *et al.* and Vandenbroucke are improperly combined; and
- There is no reasonable expectation of success in the asserted combination of Banbrook *et al.* and Vandenbroucke.

Each of these points will now be addressed in turn.

[1] Claims 9, 20, and 31 are rejected on a combination Banbrook *et al.*, Vandenbroucke, and Burke *et al.* Burke *et al.* is not within the scope and content of the prior art. However, Applicants do not develop this argument in light of the other, more far-reaching errors. Applicants nevertheless point out for the record that they do not acquiesce in the Office's implied assertion that Burke *et al.* is prior art to the claims.

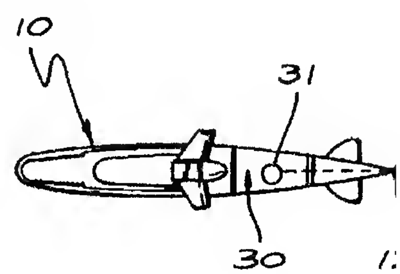
1. The Office Misconstrues Banbrook *et al.*

The Office misconstrues Banbrook *et al.* as "[disclosing] an apparatus for use in a marine seismic survey (abstract; Column 1)" and "a seismic survey object" (Fig. 1) (Column 3, Line 55 to Column 4, Line 36)." (Office Action dated December 29, 2010, p. 3) This is incorrect. The word "seismic" never appears in Banbrook *et al.* and the Office provides no explanation as to how the disclosed apparatus could ever be considered a seismic survey spread.

Banbrook *et al.* actually discloses something quite different—a passive, towed array SONAR system for use in underwater warfare. The quickest way to determine that Banbrook *et al.* is not a seismic survey is that the vessel towing the array in the illustrated embodiments, shown below, is a submarine. This is apparent from the drawings, which show the vessel (reproduced below) to be a submarine from a plan, overhead view and from the description:

> With reference to FIG. 1, a navigational vessel 10, such as a surface ship ***or submarine***, is shown towing an array 11,

(col. 1, lines 57-60, emphasis added) Submarines are not ever used to tow arrays during seismic surveys. Submersible, remotely operated vehicles are sometimes used in deployment and/or retrieval, but they are not referred to as submarines in the art and they are not used to tow arrays during surveys.



"It is well settled that a prior art reference is relevant for all that it teaches to those of ordinary skill in the art." M.P.E.P. §2141.02 VI; *In re Fritch*, 23 U.S.P.Q.2d (BNA) 1780, 1782 (Fed. Cir. 1992). In determining patentability, one simply cannot ignore parts of references. *Fritch*, 23 U.S.P.Q.2d (BNA) at 1782. Considering Banbrook *et al.* as a whole, one skilled in the present art would appreciate that it discloses a passive, towed array SONAR system for use in underwater warfare. The Office therefore errs when it alleges that Banbrook *et al.* teaches "an apparatus for use in a marine seismic survey" and "a seismic survey object".

One ground on which the Office rejected this argument is that the word "SONAR" does not appear in Banbrook *et al.*, thereby "undercutting" Applicants argument. ("Advisory Action Before the Filing of an Appeal Brief" dated July 7, 2010, Continuation Sheet) As Applicants noted above, the word "seismic" never appears in Banbrook *et al.*, either. But what the Office misses is that these facts mean different things to those skilled in the art. For one thing, Banbrook *et al.* nowhere teaches a source, meaning the towed array is passive—like a passive

towed array SONAR system. Furthermore, as discussed above, Banbrook *et al.* discloses a "submarine" such as is not used in the art.

The Office also discounts this on the basis of a "submarine vessel" disclosed U.S. Letters 5,747,754 ("Svenning *et al.*"). . ("Advisory Action Before the Filing of an Appeal Brief" dated July 7, 2010, Continuation Sheet) The Office construes this as a "submarine". This is completely contrary to the construction afforded by those skilled in the art. The "submarine vessel" of Svenning *et al.* is an unmanned remotely operated vehicle ("ROV"), which are well known for deployment of ocean bottom cables in seabed surveys. A "submarine", to the extent known in the art, is a manned submarine and these are not used in seismic surveys. Furthermore, contrary to the Office's construction, Svenning *et al.* does not teach towing arrays during surveys—only ocean bottom cables in a seabed survey. For which, as Applicants note above, the art employs unmanned ROVs rather than submarines.

"It is axiomatic that, in proceedings before the PTO, claims in an application are to be given their broadest reasonable interpretation consistent with the specification, [] and *that claim language should be read in light of the specification as it would be interpreted by one of ordinary skill in the art.*" *In re Bond*, 15 U.S.P.Q.2d (BNA) 1566, 1567 (Fed. Cir. 1990); quoting *In re Sneed*, 218 U.S.P.Q. (BNA) 385, 388 (Fed. Cir. 1983) (emphasis added). Thus, the broadest reasonable construction of the claims and the art is bounded by the understanding of those in the art:

> Although the PTO emphasizes that it was required to give all "claims their broadest reasonable construction" particularly with respect to ...use of the open-ended term "comprising," this court has instructed that any such construction be "consistent with the specification, . . . and that claim language should be read in light of the specification as it would be interpreted by one of ordinary skill in the art."
>
> The PTO's construction here, though certainly broad, is unreasonably broad. The broadest-construction rubric coupled with the term "comprising" does not give the PTO an unfettered license to interpret claims to embrace anything remotely related to the claimed invention. Rather, claims should always be read in light of the specification and teachings in the underlying patent.

In re Suitco Surface, Inc., 94 U.S.P.Q.2d (BNA) 1640, 1644 (Fed. Cir. 2010) (citations omitted).

Banbrook *et al.* teaches a technique in which a manned submarine may tow a passive SONAR array. That it also teaches that the SONAR array may be towed by a surface vessel

does not erase this fact. Nor does the absence of the word "SONAR" from the description. To the extent that the absence of language from Banbrook *et al.* limits the scope of its disclosure, it also does not mention "seismic", and therefore does not teach anything regarding a seismic survey.

Furthermore, the fact that Svenning teaches the use of a "submersible vessel" does not mean that it teaches the use of *any* submersible vessel. As noted in Applicants' specification, submersible ROVs are sometimes used in marine seismic surveys. But never manned submarines like the one taught in Banbrook *et al.* and never to tow an array of receivers. Banbrook *et al.* therefore does not teach anything regarding a seismic survey and Svenning's generic reference to a different class of "submersible vessels" does not rehabilitate it.

When those skilled in the art look at Banbrook *et al.* and see the manned submarine embodiment illustrated in FIG. 1, they will immediately realize it is directed to a passive SONAR array rather than a seismic survey. They will also understand that SONAR is very different from seismic surveying. SONAR investigates the water column whereas seismic surveying investigates the subterranean structures beneath the seabed that bounds the water column. Furthermore, events occurring in the water column are anathema in seismic surveying, typically introducing error. The Office has accordingly misconstrued and misapplied Banbrook *et al.*

2. The Art of Record Fails to Teach or Suggest <u>All the Limitations of the Claims</u>

To establish a *prima facie* case of obviousness, the prior art references must teach or suggest all the claim limitations. M.P.E.P. §706.02(j); *In re Royka*, 180 U.S.P.Q. (BNA) 580 (CCPA 1974). As is established immediately above, Banbrook *et al.* does not teach "an apparatus for use in a marine seismic survey" and "a seismic survey object". It therefore follows that it cannot teach "an inertial measurement unit coupled to the seismic survey object" as is recited in the independent claims. Furthermore, there is no allegation of anything regarding "an inertial measurement unit" in Vandenbroucke and Applicants' review has yielded none. The combination of references therefore fails to teach or suggest such a limitation.

Still further, Banbrook *et al.* presents its inertial measurement unit ("IMU") -based approach as a full solution to the problem it addresses. That is, there is no concession of any drawback or limitation on the efficacy of the technique in addressing that problem.

Vandenbroucke similarly presents his ultrashort baseline ("USBL") -based approach as a full solution to the problem that it addresses. Again, there is no indication that there is any deficiency or drawback to the technique. Both techniques are disclosed as whole and complete within themselves and fully capable of addressing the problem for which they were designed to resolve. So not only is there no teaching of the subject limitations, there is no teaching that might suggest such a limitation.

The combination of Banbrook *et al.* and Vandenbroucke therefore neither teaches nor suggests all the limitations of the claims. They therefore, in combination, do not render obvious any of claims 1-5, 7-8,10-19, 21-30, and 32-69. M.P.E.P. §706.02(j); *In re Royka*, 180 U.S.P.Q. (BNA) 580 (CCPA 1974). Since these claims are incorporated into claims 6, 9, 20, and 31, and those rejections depend upon these, the art of record does not render obvious any claim.

3. Banbrook *et al.* is Outside the Scope & <u>Content of the Prior Art</u>

It is the Office's burden to establish that the references are within the scope and content of the prior art. *In re Oetiker*, 24 U.S.P.Q.2d (BNA) 1443, 1445-46 (Fed. Cir. 1992). A reference can be asserted against the claimed invention under §103 only if (1) it is within Applicant's field of endeavor, or (2) is reasonably pertinent to the problem facing Applicant even though not within Applicant's field of endeavor. *In re Clay*, 23 U.S.P.Q.2d (BNA) 1058, 1060 (Fed. Cir. 1992).

a. The Application of the Test

Banbrook *et al.* is clearly not within Applicants' field of endeavor. The evidence of record, namely Applicants' specification, establishes that, "The invention pertains to seismic surveying and, more particularly, to a method and apparatus for more accurately determining the position of seismic survey objects in a marine seismic survey. (¶[0002] of the application as published) When Banbrook *et al.* is considered as whole and as by one skilled in the art as is required, M.P.E.P. §2141.02 VI; *In re Fritch*, 23 U.S.P.Q.2d (BNA) 1780, 1782 (Fed. Cir. 1992), it clearly teaches a passive, towed array SONAR system for use in underwater warfare. Banbrook *et al.* therefore is not within Applicants' field of endeavor.

That leaves, then, the question of whether Banbrook *et al.* is "reasonably pertinent". The courts have provided guidance on this question:

> A reference is reasonably pertinent if, even though it may be in a different field from that of the inventor's endeavor, it is one which, because of the matter with which it deals, logically would have commended itself to an inventor's attention in considering his problem. Thus, ***the purposes of both the inventor and the prior art are important in determining whether the reference is reasonably pertinent to the problem the invention attempts to solve.*** If a reference disclosure has the same purpose as the claimed invention, the reference relates to the same problem, and that fact supports use of that reference in an obviousness rejection. An inventor may well have been motivated to consider the reference when making his invention. ***If it is directed to a different purpose, the inventor would accordingly have less motivation or occasion to consider it.***

Clay, 23 U.S.P.Q.2d (BNA) at 1060.

The use of passive—or even active—towed array SONAR systems for use in underwater warfare operate significantly differently and under significantly different constraints relative to marine seismic surveys. Sonar systems such as those disclosed in Banbrook *et al.* are used to detect and track moving objects in the water column that are relatively close to the vessel. A seismic survey, on the other hand, does not track anything, is not interested in moving objects, considers any information from the water column to be noise, and is interested in geologic formations typically at great distance from the vessel.

Furthermore, the target detected and tracked by the SONAR system of Banbrook *et al.* will typically have the ability to fire on the vessel deploying the array—a threat not posed by subsurface geological formation in a seismic survey. And, still further, frequencies used in SONARs such as that disclosed in Banbrook *et al.* operate at frequencies very different from seismic frequencies. The SONAR system of Banbrook *et al.* is always as concerned about the content of the water column immediately in front of and behind the vessel as it is below the vessel.

Factors such as these affect all manner of design and operational considerations for the respective towed-arrays, and these differences evidence the distinctiveness of these two fields of endeavor. *See Clay*, 23 U.S.P.Q.2d (BNA) at 1060-61; *In re Horn*, 203 U.S.P.Q. (BNA) 969, 971 (C.C.P.A. 1979). They furthermore establish the fact that those ordinarily skilled in the art would not turn to the art of SONAR systems.

b. Illustrative Legal Precedents

Applicants direct the Office's attention to two court decisions that can help elucidate Applicants' position. The first is the Federal Circuit's decision in *In re Clay*, previously cited above. The second is the decision of the Court of Customs and Patent Appeals—a predecessor to the Federal Circuit whose decisions are binding on this proceeding—in *In re Pagliero*, 210 U.S.P.Q. (BNA) 888 (CCPA 1981).

The application in *Clay* eventually issued as U.S. Letters Patent 5,172,825 ("the `825 patent"), and so its subject matter is readily discernible. The claims on appeal were reproduced in the Court's decision as reported. As the "Abstract" states, the claims were generally directed to:

> A process for storing a refined liquid hydrocarbon product in a storage tank having a dead volume. The process comprises filling the dead volume with a rigid crosslinked polymer gel and storing product in the remaining internal volume of the storage tank.

(`825 patent, "Abstract") The reference involved in the appeal was U.S. Letters Patent 4,683,949 ("the `949 patent"), and so its content is also readily discernible. The "Abstract" of the `949 patent reads, in pertinent part:

> Conformance improvement is achieved in a subterranean hydrocarbon-bearing formation using a gel comprised of a high molecular weight water-soluble acrylamide polymer, a chromium III/carboxylate complex capable of crosslinking the polymer and an aqueous solvent. The gel components are combined at the surface and injected into the desired treatment zone via a wellbore to form a continuous single-phase gel.

(`949 patent, "Abstract")

In the appeal, Clay challenged the rejections on the ground that the reference was outside the scope and content of the prior art. *Clay*, at 1060. The court summarized the Office's position as follows:

> The PTO argues that [the reference] and [Applicant's] inventions are part of a common endeavor—"maximizing withdrawal of petroleum stored in petroleum reservoirs."

Id. The court rejected this argument:

> However, [the reference] cannot be considered to be within [Applicant's] field of endeavor merely because both relate to the petroleum industry. ...[Applicant's] field of endeavor is the *storage* of refined liquid hydrocarbons. The field of endeavor of the [reference], on the other hand, is the *extraction* of crude petroleum.

> The Board clearly erred in considering [the reference] to be within the same field of endeavor as [Applicant's].

Id. Note that the Office had characterized the field of endeavor too broadly to be supported by the record. With respect to the second part of the test, the Federal Circuit, after a discussion of the two inventions, held:

> A person having ordinary skill in the art would not reasonably have expected to solve the problem of dead volume in tanks for storing refined petroleum by considering a reference dealing with plugging underground formation anomalies. The Board's finding to the contrary is clearly erroneous.

Id., at 1061. Thus, defining a field of endeavor beyond that supported by the disclosures does not bring the reference within the scope and content of the prior art for obviousness purposes.

In re Pagliero also teaches this principle. In *Pagliero*, the Applicant claimed a "method for producing a decaffeinated vegetable material." *Id.*, 210 U.S.P.Q. (BNA) at 888. The claims were rejected over three references:

- a primary reference ("Nutting *et al.*") that taught a decaffeination process employing a de-oiling step to separate out coffee oils prior to decaffeination;
- a secondary reference ("Rector") that taught grinding roasted coffee beans with oil and pulverizing the resultant mixture to obtain a powdered coffee; and
- an alternative secondary reference ("Aiello") that taught a "lipoid theory" of narcotics.

Id., at 889-90.

The Board affirmed the rejections on appeal, part of the opinion being quoted in the court's decision. The Board held:

> However, we are convinced that it would have been obvious within the meaning of Section 103 to utilize a liquid water-immiscible fatty material as the decaffeinating medium for producing decaffeinated vegetable materials in view of the disclosures in the Rector and Aiello references.
>
> *****
>
> Since it is readily apparent from the foregoing teachings in Rector and Aiello that caffeine is soluble in fatty materials, we are convinced that it would have been obvious to one of ordinary skill in the art to utilize such materials to remove caffeine from the caffeine-containing materials of Nutting. Appellants have merely substituted

> one known caffeine solvent for another such solvent and have only obtained the expected results.

Id., at 891.

Thus, the Board construed the relevant art broadly as "decaffeination" processes. The court, however, held that the Board "...misinterpreted the disclosure of Rector, ...erroneously considered a non-analogous publication (Aeillo), and ...failed to consider the teaching of the references as a whole." *Id.*, at 891-92. In addressing whether Aeillo was analogous, the court stated that:

> Our determination here is not without difficulty. However, we think the difficulty arises from not considering the subject matter as a whole and instead focusing on the scientific principle involved....

Id. at 892, quoting *In re Van Wanderham*, 154 U.S.P.Q. (BNA) 20, 25 (1967). So *Pagliero* teaches that focusing on an involved scientific principle, rather than the subject matter as a whole, can lead to an overly broad definition for the field of endeavor and lead to the erroneous inclusion of non-analogous art.

c. Conclusion on Analogous Art

Applicants respectfully submit that the Office is improperly focusing on a single application of a technological principle common to both the claims and Banbrook *et al.* rather than considering the subject matter of the claims and Banbrook *et al.* as wholes. "[T]he mere fact that a device or process utilizes a known scientific principle does not alone make that device or process obvious." *In re Brouwer*, 37 U.S.P.Q.2d (BNA) 1663, 1666 (Fed. Cir. 1995), quoting *Uniroyal, Inc. v. Rudkin-Wiley Corp.*, 5 U.S.P.Q.2d (BNA) 1434, 1440 (Fed. Cir. 1988).

The improper focus on the technological principle has, as in *Pagliero*, resulted in the consideration of non-analogous art. The Office has not yet identified what it considers to be Applicants' field of endeavor, or what it considers to be the problem that Applicants' are confronting. However, it is apparent that its formulations must be too broad as was the case not only in *Pagliero*, but also in *Clay*.

When both Banbrook *et al.* and the claims are considered as a whole, rather than for their one commonality, it is evident that Banbrook *et al.* is from a non-analogous art. It is evident that the present claims recite a position determining technique for use in a marine seismic survey. Banbrook *et al.* plainly teaches a technique for determining position on a cable in a SONAR

array. The differences between the SONAR application and the marine seismic survey far outweigh the one similarity on which the Office has focused in terms of whether one skilled in the art addressing the problem confronting the inventors would look to Banbrook *et al.* for help. Since Banbrook *et al.* is directed to a different purpose than the claimed invention, one of ordinary skill in the art "would accordingly have had less motivation or occasion to consider it". *Clay*, 23 U.S.P.Q.2d (BNA) 1061. Banbrook *et al.* is therefore outside the scope and content of the prior art. *Clay*, 23 U.S.P.Q.2d (BNA) at 1060; *Pagliero*, 210 U.S.P.Q. (BNA) at 888-890.

4. **<u>Banbrook *et al.* & Vandenbroucke are Improperly Combined</u>**

It is the Office's burden to establish that the references are combinable. *In re Oetiker*, 24 U.S.P.Q.2d (BNA) 1443, 1446 (Fed. Cir. 1992). The Office's justification for combining the references is that:

> It would have been obvious to modify Banbrook to include using short baseline or ultrashort baseline acoustic positioning systems with the survey components as taught by Vandenbroucke in order to determine the position of the survey components relative to the vessel or other components in the survey so that the positions will be known for processing the data acquired.

(Office Action dated December 29, 2009, pp. 3-4) There are a number of errors in this position.

A number of these errors arise from those already discussed above. For example, Banbrook *et al.* does not teach anything regarding a "seismic survey" or a "seismic survey object" as is assumed by this reasoning. Banbrook *et al.* is outside the scope and content of the prior art, and so its teachings become apparent only in the hindsight of Applicants' disclosure. Furthermore, although both references teach the use of hydrophones, it is evident to those skilled in the art that different frequencies are used in SONAR than in seismic survey and so the inference that the two use the "same" sensors is not supported in the record.

But most significant among these errors is that the Office's reasoning does not find any basis in the evidence of record. The Office alleges that the motivation is "…so that the positions will be known for processing the data acquired". However, both Banbrook *et al.* and Vandenbrouke already affirmatively state that their respective techniques already provide this benefit. The record therefore establishes that not only was such position determination already known, there were at least two different, alternative techniques for doing it. And, as noted above, neither Banbrook *et al.* nor Vandenbroucke suggests any deficiencies that might be cured by combining their technique with

another. Thus, not only is there no longer any motivation to find a way to determine position, but Banbrook *et al.* and Vandenbrouke already provide two different ways to meet this desire.

Indeed, the only teaching or suggestion in the record that IMU-based and USBL-based techniques might be improved upon in any way, much less through combination, is in Applicants' disclosure. This is the very definition of "hindsight". One cannot use Applicant's disclosure as a "template" or a "pattern" from which to reconstruct his invention from the prior art. *In re Gorman*, 18 U.S.P.Q.2d (BNA) 1885 (Fed. Cir. 1991); *In re Fritch*, 23 U.S.P.Q.2d (BNA) 1780 (Fed. Cir. 1992); *In re Oetiker*, 24 U.S.P.Q.2d (BNA) 1443 (Fed. Cir. 1992). "The combination of elements from non-analogous sources, in a manner that reconstructs the applicant's invention only with the benefit of hindsight, is insufficient to present a *prima facie* case of obviousness." *In Re Oetiker*, 24 U.S.P.Q.2d (BNA) 1443 (Fed. Cir. 1992).

5. There is No Reasonable Expectation of <u>Success in the Assserted Combination</u>

The art of record must establish a reasonable probability of success arising therefrom. M.P.E.P. §2143.02; *In re Naylor*, 152 U.S.P.Q. (BNA) 106, 108 (C.C.P.A. 1966); *In re Rinehart*, 189 U.S.P.Q. (BNA) 143, 148 (C.C.P.A. 1976). Both Banbrook *et al.* and Vandenbrouke already affirmatively state that their respective technique provide position determination and represents their technique as complete. Neither Banbrook *et al.* nor Vandenbroucke suggests any deficiencies that might be cured by combining their technique with another. Thus, even ignoring the other deficiencies in the *prima facie* case, the only thing that one skilled in the art would expect from combining the two techniques is an unnecessary and undesirably complex, expensive, duplication of effort. This is not a "reasonable expectation of success", and so the combination fails to render obvious any claim.

B. CLAIM 6 IS UNOBVIOUS OVER BANBROOK *ET AL.*, VANDENBROUCKE &AMBS

The Office erred in rejecting claim 6 as obvious under 35 U.S.C. §103(a) over Banbrook *et al.* and Vandenbroucke in combination with U.S. Letters Patent 6,011,752 ("Ambs"). This rejection relies upon the combination of Banbrook *et al.* and Vandenbroucke with respect to the independent claims. It therefore manifests the same errors as does the rejection of the independent claims on that combination of art. Accordingly, Applicants hereby incorporate by

reference their arguments set forth in Section VII A of this brief above as if set forth here *verbatim* in response to this rejection as well.

C. CLAIMS 9, 20, & 31 ARE UNOBVIOUS OVER BANBROOK *ET AL.*, VANDENBROUCKE & BURKE *ET AL.*

The Office erred in rejecting claims 9, 20, and 31 as obvious under 35 U.S.C. §103(a) over Banbrook *et al.* and Vandenbroucke in view of U.S. Letters Patent 5,739,787 ("Burke *et al.*"). This rejection relies upon the combination of Banbrook *et al.* and Vandenbroucke with respect to the independent claims. It therefore manifests the same errors as does the rejection of the independent claims on that combination of art. Accordingly, Applicants hereby incorporate by reference their arguments set forth in Section VII A of this brief above as if set forth here *verbatim* in response to this rejection as well.

D. CONCLUDING REMARKS

Applicants respectfully submit that all claims are in condition for allowance.

VIII. CLAIMS APPENDIX

The claims that are the subject of the present appeal are set forth in the attached "Claims Appendix." The claims that are not subject to this appeal are also set forth for the convenience of the Board.

IX. EVIDENCE APPENDIX

There is no separate Evidence Appendix for this appeal.

X. RELATING PROCEEDINGS APPENDIX

There is no Related Proceedings Appendix for this appeal.

XI. CONCLUSION

In view of the foregoing, it is respectfully submitted that the Examiner erred in not allowing claims 1-69 over the prior art of record. Applicants therefore pray that that the

rejections be REVERSED and the claims allowed to issue. The undersigned may be contacted at (713) 934-4053 with respect to any questions, comments or suggestions relating to this appeal.

Respectfully submitted,

Date: October 12, 2010

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Claims Appendix

(Claims in Issue)

1. An apparatus for use in a marine seismic survey, comprising:

a short baseline acoustic system or an ultra short baseline acoustic system, including:

a seismic survey object; and

an inertial measurement unit coupled to the seismic survey object at a known point and from which the movement of the seismic survey object can measured during a seismic survey such that the position of the known point during the marine seismic survey can be determined.

2. The apparatus of claim 1, wherein the seismic survey object comprises one of a seismic cable, a seismic receiver, a steering device, and a seismic source.

3. The apparatus of claim 2, wherein the seismic survey object is the seismic cable and the seismic cable comprises one of a streamer and an ocean bottom cable.

4. The apparatus of claim 2, wherein the seismic survey object is the seismic cable and the seismic cable includes one of a sensor module, a steering device, and an inertial positioning device in which the inertial measurement unit is housed.

5. The apparatus of claim 2, wherein the seismic survey object is the seismic cable and the seismic cable includes a plurality of acoustic receivers.

6. The apparatus of claim 2, wherein the seismic survey object is the steering device and the steering device comprises one of a Q-fin and a bird.

7. The apparatus of claim 2, wherein the seismic survey object is the seismic source and the seismic source comprises at least one of an air gun and a vibrator.

8. The apparatus of claim 1, further comprising an inertial positioning device in which the inertial measurement unit is housed.

9. The apparatus of claim 1, wherein the inertial positioning device further comprises:

a power system for the inertial measurement unit;

a communication interface; and

a battery powering the power system and the communication interface.

10. The apparatus of claim 1, wherein the inertial measurement unit comprises a plurality of accelerometers and gyroscopes.

11. The apparatus of claim 1, wherein the inertial measurement unit comprises a micro-electromechanical inertial measurement unit.

12. The apparatus of claim 8, wherein the inertial positioning device further comprises an acoustic node determined by either an acoustic source or receiver.

13. The apparatus of claim 12, wherein the acoustically determined point comprises one of an ultra-short baseline acoustic system, a short baseline acoustic system, or a distance measurement acoustic system.

14. A marine seismic spread, comprising:

a short baseline acoustic system or an ultra short baseline acoustic system, including:

a plurality of seismic survey objects, including a plurality of acoustic receivers and at least one acoustic source, distributed over a survey area from at least one known point; and

a plurality of inertial positioning coupled to the seismic survey objects at known points and capable of taking inertial measurements of the movement of the

seismic survey objects relative to the known point such that the position of the known points during the marine seismic survey can be determined.

15. The marine seismic spread of claim 14, wherein the plurality of seismic survey objects include a plurality of seismic cables comprised of the acoustic sources and the inertial positioning devices.

16. The marine seismic spread of claim 15, wherein the seismic cables comprise one of a plurality of streamers and a plurality of ocean bottom cables.

17. The marine seismic spread of claim 14, wherein the seismic survey objects include one of a plurality of inertial positioning devices and a plurality of steering devices in which the inertial positioning devices are housed.

18. The marine seismic spread of claim 14, wherein the plurality of acoustic receivers comprise a plurality of hydrophones or geophones.

19. The marine seismic spread of claim 14, wherein the inertial measurement unit is housed in an inertial positioning device.

20. The marine seismic spread of claim 18, in which the inertial positioning device further comprises:

a power system for the inertial measurement units;

a communication interface; and

a battery powering the power system and the communication interface.

21. The marine seismic spread of claim 14, wherein at least one of the inertial measurement units comprises a plurality of accelerometers and gyroscopes.

22. The marine seismic spread of claim 14, wherein at least one of the inertial measurement units comprises a micro-electromechanical inertial measurement unit.

23. The marine seismic spread of claim 19, wherein the inertial positioning device further comprises an acoustic node determined by either an acoustic source or receiver.

24. The marine seismic spread of claim 23, wherein the acoustic source comprises one of an ultra-short baseline acoustic system, a short baseline acoustic system, or a distance measurement acoustic system.

25. An apparatus for use in a marine seismic survey, comprising:

a short baseline acoustic system or an ultra short baseline acoustic system, including:

a seismic cable; and

an inertial measurement unit coupled to the seismic cable at a known point and from which the movement of the seismic cable can measured during a seismic survey such that the position of the known point during the marine seismic survey can be determined.

26. The apparatus of claim 25, wherein the seismic cable comprises one of a streamer and an ocean bottom cable.

27. The apparatus of claim 25, wherein the seismic cable includes one of a sensor module, a steering device, and an inertial positioning device in which the inertial measurement unit is housed.

28. The apparatus of claim 25, wherein the seismic cable includes a plurality of acoustic receivers.

29. The apparatus of claim 28, wherein the plurality of acoustic receivers comprise a plurality of hydrophones or a plurality of geophones.

30. The apparatus of claim 25, wherein the inertial measurement unit is housed within an inertial positioning device.

31. The apparatus of claim 30, wherein the inertial positioning device further comprises:

a power system for the inertial measurement units;

a communication interface; and

a battery powering the power system and the communication interface.

32. The apparatus of claim 25, wherein at least one of the inertial measurement units comprises a plurality of accelerometers and gyroscopes.

33. The apparatus of claim 25, wherein at least one of the inertial measurement units comprises a micro-electromechanical inertial measurement unit.

34. The apparatus of claim 30, wherein the inertial positioning device further comprises an acoustic node determined by either an acoustic source or receiver.

35. The apparatus of claim 34, wherein the acoustic source comprises one of an ultra-short baseline acoustic system, a short baseline acoustic system, or a distance measurement acoustic system.

36. A method for use in a marine seismic survey, comprising:

taking inertial measurements of movement of selected points on a seismic spread in a short baseline acoustic system or an ultra short baseline acoustic system relative to at least one known point; and

applying the inertial measurements to the known point to determine the positions of the selected points.

37. The method of claim 36, wherein taking the inertial measurements includes taking the inertial measurements during at least one of deploying the spread, retrieving the spread and conducting a survey.

38. The method of claim 36, further comprising supplementing the inertial measurements.

39. The method of claim 38, wherein supplementing the inertial measurements comprises at least one of calibrating the positions using a coordinate history determined from acoustic ranging signals and integrating one dimensional measures.

40. The method of claim 36, further comprising deploying the seismic spread at the known point.

41. The method of claim 40, wherein deploying the seismic spread at the known point includes one of deploying the seismic spread to the bottom of a body of water and deploying the seismic spread near to the surface of the body of water.

42. The method of claim 40, wherein deploying the seismic spread at the known point includes deploying the seismic spread in one of saltwater, fresh water, and brackish water.

43. The method of claim 36, further comprising housing an inertial measurement unit in a seismic survey object.

44. The method of claim 43, wherein housing the inertial measurement unit in a seismic survey object includes housing the inertial measurement unit in one of a seismic cable, a seismic receiver, a steering device, and a seismic source.

45. The method of claim 36, wherein taking inertial measurements of the movement of selected points on the seismic spread includes taking inertial measurements of the movement of selected seismic survey objects.

46. The method of claim 45, wherein taking inertial measurements of the movement of selected seismic survey objects includes taking inertial measurements of the movement of at least one of a seismic cable, a seismic receiver, a steering device, and a seismic source.

47. The method of claim 36, wherein the seismic cable includes seismic survey objects having known relative orientations with respect to the selected points on the seismic cable, and the method further comprises determining positions of the selected seismic survey objects based on the determined positions of the selected points and the known relative orientations.

48. A method for use in a marine seismic survey, comprising:

deploying a short baseline acoustic system or an ultra short baseline acoustic system, including a seismic cable at a known point;

taking inertial measurements of movement of selected points on the seismic cable relative to the known point during the deployment; and

applying the inertial measurements to the known point to determine the positions of the selected points.

49. The method of claim 48, wherein the seismic cable includes seismic survey objects having known relative orientations with respect to the selected points on the seismic cable, and the method further comprises determining positions of the selected seismic survey objects based on the determined positions of the selected points and the known relative orientations.

50. The method of claim 48, wherein deploying the seismic cable comprises one of deploying the seismic cable to the bottom of the water and deploying the seismic cable near to the surface of the water.

51. The method of claim 48, further comprising supplementing the inertial measurements.

52. The method of claim 51, wherein supplementing the inertial measurements comprises at least one of calibrating the positions using a coordinate history determined from acoustic ranging signals and integrating one dimensional measures.

53. The method of claim 51, wherein deploying the seismic cable at the known point includes one of deploying the seismic cable to the bottom of a body of water and deploying the seismic cable near to the surface of the body of water.

54. The method of claim 51, wherein deploying the seismic cable at the known point includes deploying the seismic cable in one of saltwater, fresh water, and brackish water.

55. The method of claim 48, further comprising housing an inertial measurement unit in a seismic survey object comprising a portion of the seismic cable.

56. The method of claim 55, wherein housing the inertial measurement unit in a seismic survey object includes housing the inertial measurement unit in one of a seismic receiver, a steering device, and a seismic source.

57. The method of claim 48, wherein taking inertial measurements of the movement of selected points on the seismic cable includes taking inertial measurements of the movement of selected seismic survey objects comprising a portion of the seismic cable.

58. The method of claim 57, wherein taking inertial measurements of the movement of selected seismic survey objects includes taking inertial measurements of the movement of at least one of a seismic receiver, a steering device, and a seismic source.

59. A method for use in a marine seismic survey, comprising:

conducting a survey with a seismic spread including a short baseline acoustic system or an ultra short baseline acoustic system deployed from at least one known point;

taking inertial measurements of movement of selected points on the seismic spread relative to the known point during the conduct of the seismic survey; and

applying the inertial measurements to the known point to determine the positions of the selected points.

60. The method of claim 59, further comprising supplementing the inertial measurements.

61. The method of claim 60, wherein supplementing the inertial measurements comprises at least one of calibrating the positions using a coordinate history determined from acoustic ranging signals and integrating one dimensional measures.

62. The method of claim 59, further comprising deploying the seismic spread at the known point.

63. The method of claim 62, wherein deploying the seismic spread at the known point includes one of deploying the seismic spread to the bottom of a body of water and deploying the seismic spread to the surface of the body of water.

64. The method of claim 62, wherein deploying the seismic spread at the know point includes deploying the seismic spread in one of saltwater, fresh water, and brackish water.

65. The method of claim 59, further comprising housing an inertial measurement unit in a seismic survey object.

66. The method of claim 65, wherein housing the inertial measurement unit in a seismic survey object includes housing the inertial measurement unit in one of a seismic cable, a seismic receiver, a steering device, and a seismic source.

67. The method of claim 59, wherein taking inertial measurements of the movement of selected points on the seismic spread includes taking inertial measurements of the movement of selected seismic survey objects.

68. The method of claim 67, wherein taking inertial measurements of the movement of selected seismic survey objects includes taking inertial measurements of the movement of at least one of a seismic cable, a seismic receiver, a steering device, and a seismic source.

69. The method of claim 59, wherein the seismic cable includes seismic survey objects having known relative orientations with respect to the selected points on the seismic cable, and the method further comprises determining positions of the selected seismic survey objects based on the determined positions of the selected points and the known relative orientations.